

FIG.1

R 1, 1	G 2, 1	R 3, 1	G 4, 1	R 5, 1	G 6, 1	R 7, 1	G 8, 1	R 9, 1	G 10, 1	R 11, 1	G 12, 1
G 1, 2	B 2, 2	G 3, 2	B 4, 2	G 5, 2	B 6, 2	G 7, 2	B 8, 2	G 9, 2	B 10, 2	G 11, 2	B 12, 2
R 1, 3	G 2, 3	R 3, 3	G 4, 3	R 5, 3	G 6, 3	R 7, 3	G 8, 3	R 9, 3	G 10, 3	R 11, 3	G 12, 3
G 1, 4	B 2, 4	G 3, 4	B 4, 4	G 5, 4	B 6, 4	G 7, 4	B 8, 4	G 9, 4	B 10, 4	G 11, 4	B 12, 4
R 1, 5	G 2, 5	R 3, 5	G 4, 5	R 5, 5	G 6, 5	R 7, 5	G 8, 5	R 9, 5	G 10, 5	R 11, 5	G 12, 5
G 1, 6	B 2, 6	G 3, 6	B 4, 6	G 5, 6	B 6, 6	G 7, 6	B 8, 6	G 9, 6	B 10, 6	G 11, 6	B 12, 6
R 1, 7	G 2, 7	R 3, 7	G 4, 7	R 5, 7	G 6, 7	R 7, 7	G 8, 7	R 9, 7	G 10, 7	R 11, 7	G 12, 7
G 1, 8	B 2, 8	G 3, 8	B 4, 8	G 5, 8	B 6, 8	G 7, 8	B 8, 8	G 9, 8	B 10, 8	G 11, 8	B 12, 8
R 1, 9	G 2, 9	R 3, 9	G 4, 9	R 5, 9	G 6, 9	R 7, 9	G 8, 9	R 9, 9	G 10, 9	R 11, 9	G 12, 9
G 1, 10	B 2, 10	G 3, 10	B 4, 10	G 5, 10	B 6, 10	G 7, 10	B 8, 10	G 9, 10	B 10, 10	G 11, 10	B 12, 10
R 1, 11	G 2, 11	R 3, 11	G 4, 11	R 5, 11	G 6, 11	R 7, 11	G 8, 11	R 9, 11	G 10, 11	R 11, 11	G 12, 11
G 1, 12	B 2, 12	G 3, 12	B 4, 12	G 5, 12	B 6, 12	G 7, 12	B 8, 12	G 9, 12	B 10, 12	G 11, 12	B 12, 12

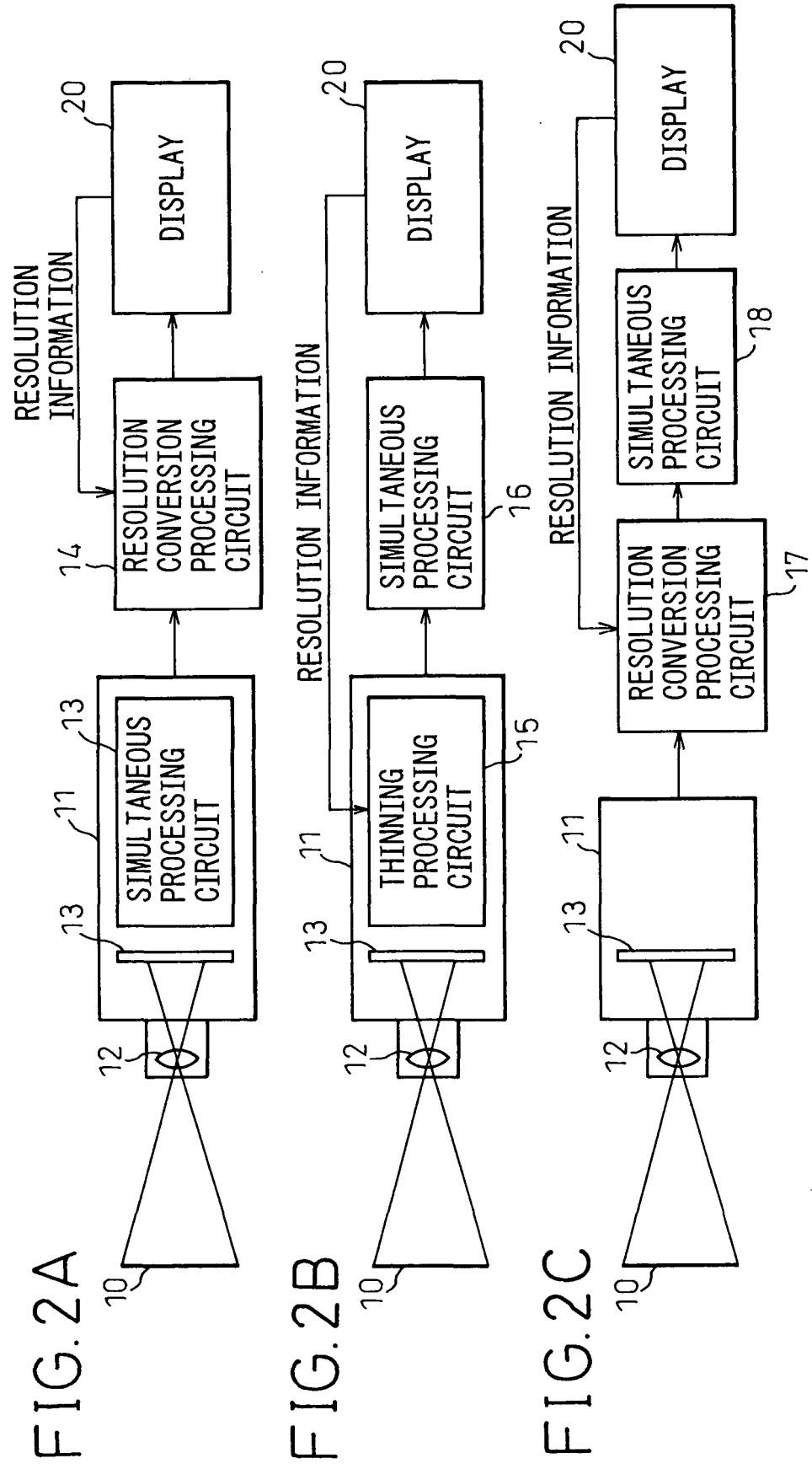
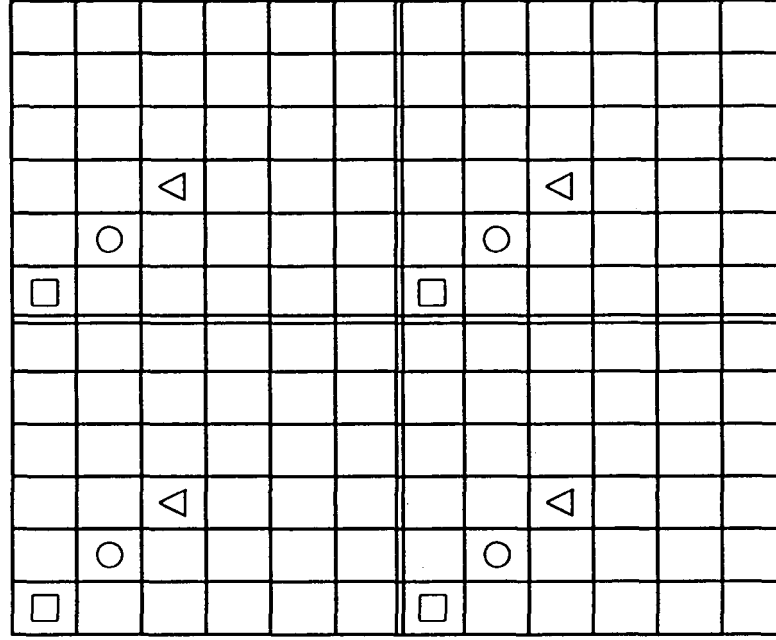
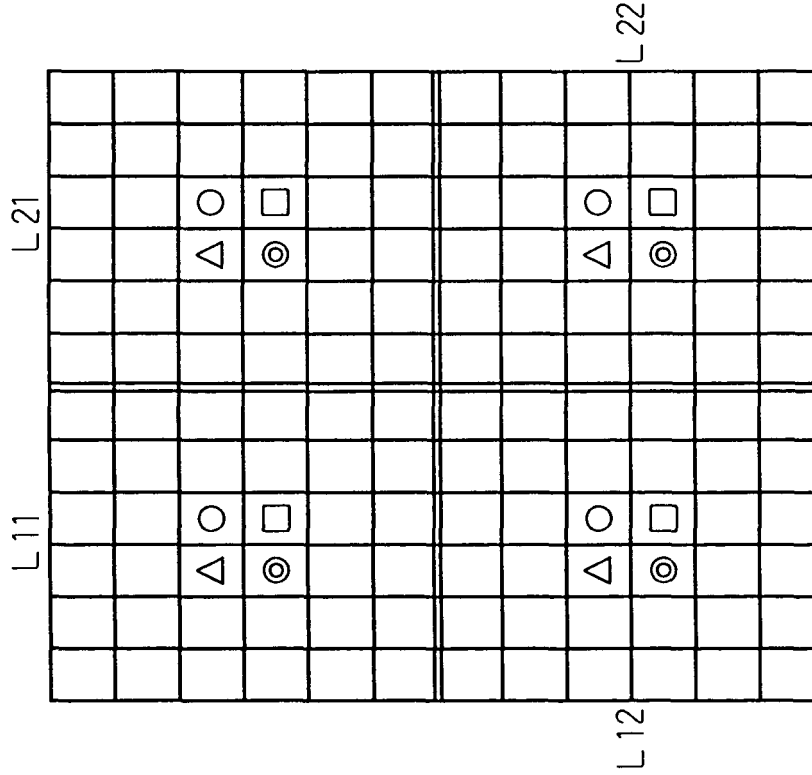


FIG.3B



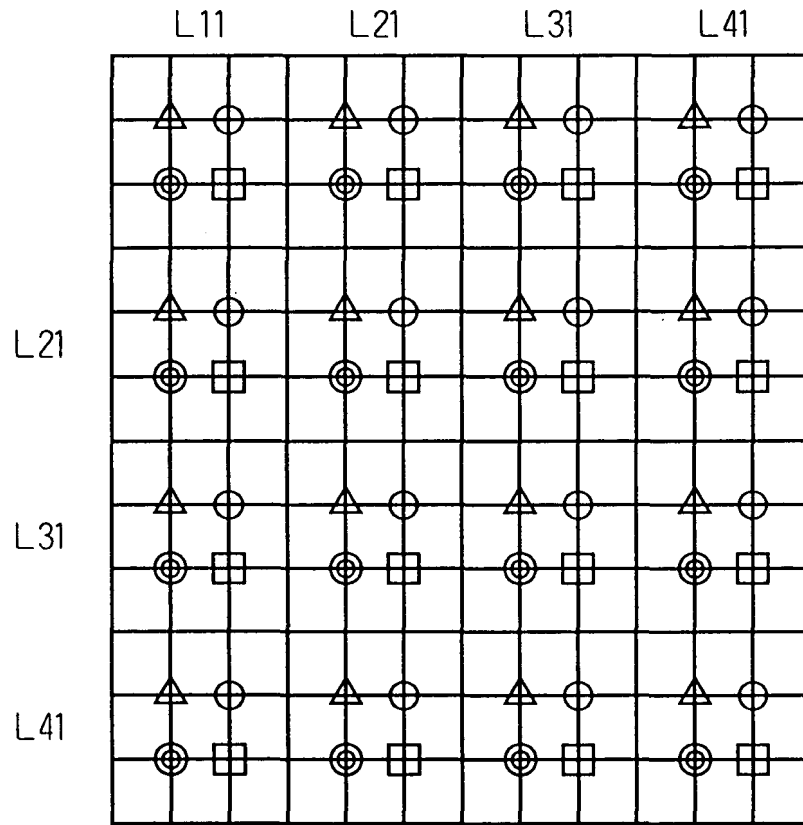
$$\begin{aligned} R &= \triangle \\ G &= (\odot(L_{21}) + \circ(L_{12}) + \\ &\quad \circ(L_{22}) + \odot(L_{22}) / 4 \\ B &= (\square(L_{11}) + \square(L_{12}) + \\ &\quad \square(L_{21}) + \square(L_{22}) / 4 \end{aligned}$$

FIG.3A



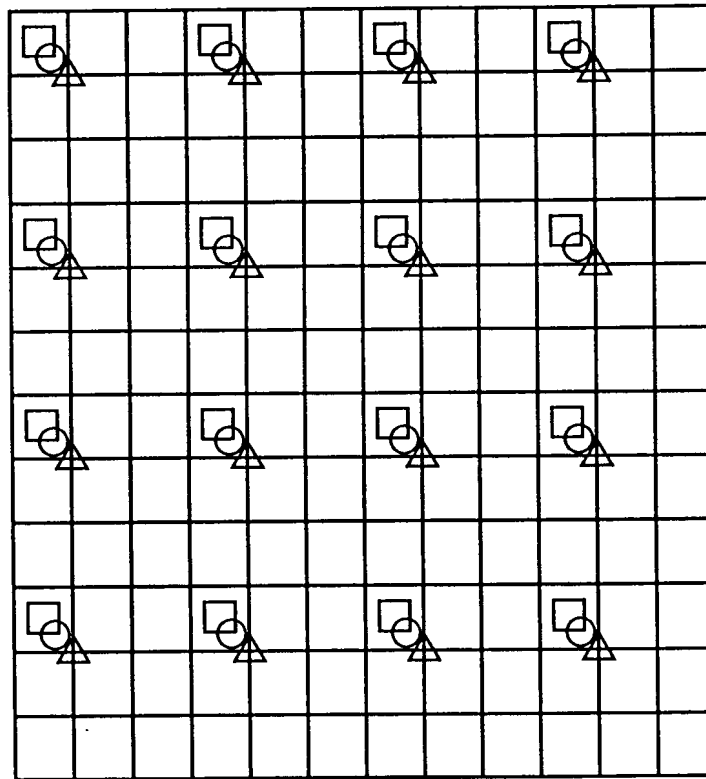
$$\begin{aligned} \triangle(R) &= (R_{11} + R_{31} + R_{51} + R_{31} + R_{33} \\ &\quad + R_{53} + R_{15} + R_{35} + R_{55}) / 9 \\ \circ(G) &= (G_{21} + G_{41} + G_{61} + G_{23} + G_{43} \\ &\quad + G_{63} + G_{25} + G_{45} + G_{65}) / 9 \\ \odot(G) &= (G_{12} + G_{32} + G_{52} + G_{14} + G_{34} \\ &\quad + G_{54} + G_{16} + G_{36} + G_{56}) / 9 \\ \square(B) &= (B_{22} + B_{42} + B_{62} + B_{24} + B_{44} \\ &\quad + B_{64} + B_{26} + B_{46} + B_{66}) / 9 \end{aligned}$$

FIG. 4



$$\begin{aligned} \triangle 1 &= (49R11 + 7R31 + 7R13 + R33)/64 \\ \bigcirc 1 &= (49G21 + 7G41 + 7G23 + G43)/64 \\ \odot 1 &= (49G12 + 7G32 + 7G14 + G34)/64 \\ \square 1 &= (49B22 + 7B42 + 7B24 + B44)/64 \end{aligned}$$

FIG.5

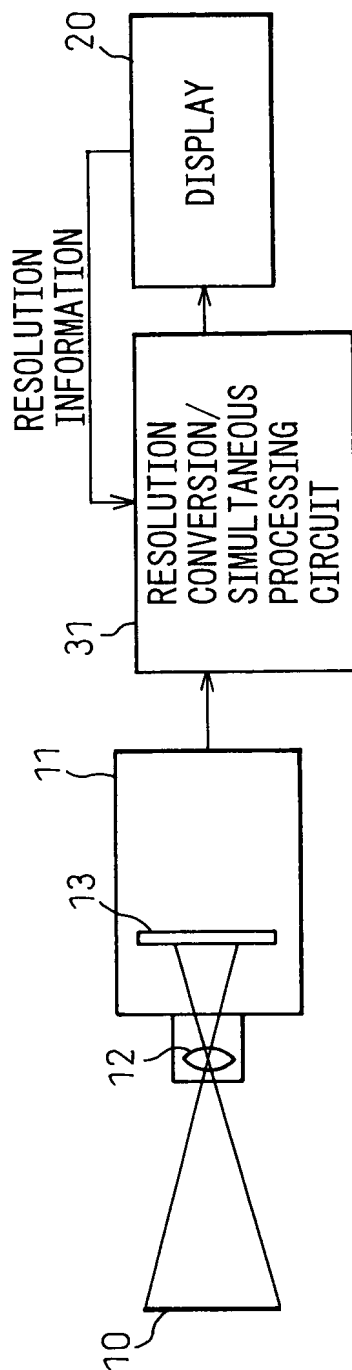


$$R = \Delta$$

$$G = (\odot(L 21) + \circ(L 12) + \circ(L 22) + \odot(L 22)) / 4$$

$$B = (\square(L 11) + \square(L 21) + \square(L 12) + \square(L 22)) / 4$$

FIG. 6



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FIG. 7A

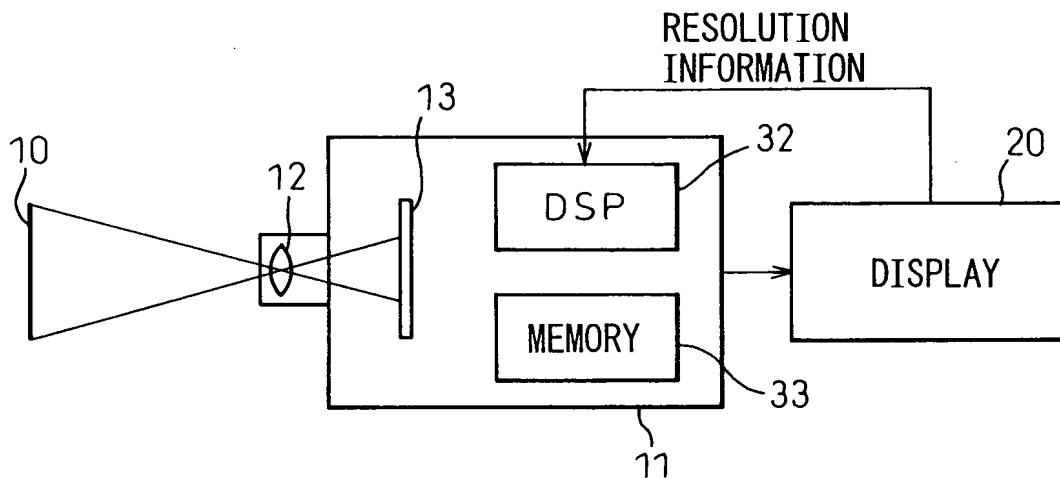
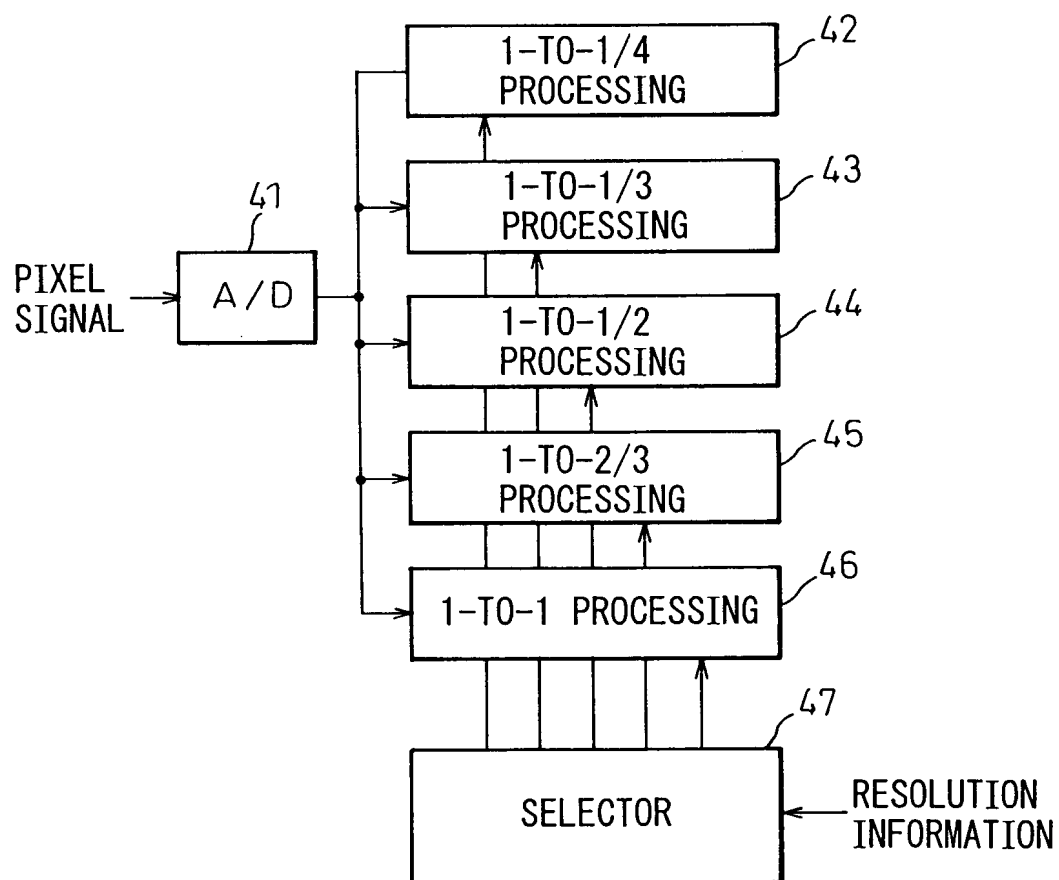


FIG. 7B



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FIG.8

R1,1	G2,1	R3,1	G4,1	R5,1	G6,1	R7,1	G8,1	R9,1	G10,1	R11,1	G12,1
G1,2	B2,2 ①	G3,2	B4,2	G5,2 ②	B6,2	G7,2	B8,2 ○	G9,2	B10,2	G11,2 ○	B12,2
R1,3	G2,3	R3,3	G4,3	R5,3	G6,3	R7,3	G8,3	R9,3	G10,3	R11,3	G12,3
G1,4	B2,4	G3,4	B4,4	G5,4	B6,4	G7,4	B8,4	G9,4	B10,4	G11,4	B12,4
R1,5	G2,5 ③	R3,5	G4,5	R5,5 ④	G6,5	R7,5	G8,5 ○	R9,5	G10,5	R11,5 ○	G12,5
G1,6	B2,6	G3,6	B4,6	G5,6	B6,6	G7,6	B8,6	G9,6	B10,6	G11,6	B12,6
R1,7	G2,7	R3,7	G4,7	R5,7	G6,7	R7,7	G8,7	R9,7	G10,7	R11,7	G12,7
G1,8	B2,8 ○	G3,8	B4,8	G5,8 ○	B6,8	G7,8	B8,8 ○	G9,8	B10,8	G11,8 ○	B12,8
R1,9	G2,9	R3,9	G4,9	R5,9	G6,9	R7,9	G8,9	R9,9	G10,9	R11,9	G12,9
G1,10	B2,10	G3,10	B4,10	G5,10	B6,10	G7,10	B8,10	G9,10	B10,10	G11,10	B12,10
R1,11	G2,11 ○	R3,11	G4,11	R5,11 ○	G6,11	R7,11	G8,11 ○	R9,11	G10,11	R11,11 ○	G12,11
G1,12	B2,12	G3,12	B4,12	G5,12	B6,12	G7,12	B8,12	G9,12	B10,12	G11,12	B12,12

$$R1 = (1 * R11 + 1 * R31 + 1 * R13 + 1 * R33) / 4$$

$$R2 = (1 * R51 + 1 * R53) / 2$$

$$R3 = (1 * R15 + 1 * R35) / 2$$

$$R4 = (1 * R55) / 1$$

$$G1 = (1 * G21 + 1 * G12 + 1 * G32 + 1 * G23) / 4$$

$$G2 = (1 * G11 + 1 * G61 + 4 * G52 + 1 * G43 + 1 * G63)$$

$$G3 = (1 * G14 + 1 * G34 + 4 * G25 + 1 * G16 + 1 * G36)$$

$$G4 = (1 * G54 + 1 * G45 + 1 * G65 + 1 * G56) / 4$$

$$B1 = (1 * B22) / 1$$

$$B2 = (1 * B42 + 1 * B62) / 2$$

$$B3 = (1 * B24 + 1 * B26) / 2$$

$$B4 = (1 * B44 + 1 * B64 + 1 * B46 + 1 * B66) / 4$$

FIG.9A

R 1, 1 ①	G 2, 1 ②	R 3, 1 ③	G 4, 1 ④	R 5, 1 ⑤	G 6, 1 ⑥	R 7, 1 ⑦	G 8, 1 ⑧	R 9, 1 ⑨	G 10, 1 ⑩	R 11, 1 ⑪	G 12, 1 ⑫
G 1, 2 ⑬	B 2, 2 ⑭	G 3, 2 ⑮	B 4, 2 ⑯	G 5, 2 ⑰	B 6, 2 ⑱	G 7, 2 ⑲	B 8, 2 ⑳	G 9, 2 ㉑	B 10, 2 ㉒	G 11, 2 ㉓	B 12, 2 ㉔
R 1, 3 ⑳	G 2, 3 ㉕	R 3, 3 ㉖	G 4, 3 ㉗	R 5, 3 ㉘	G 6, 3 ㉙	R 7, 3 ㉚	G 8, 3 ㉛	R 9, 3 ㉜	G 10, 3 ㉝	R 11, 3 ㉞	G 12, 3 ㉟
G 1, 4 ㊱	B 2, 4 ㊲	G 3, 4 ㊳	B 4, 4 ㊴	G 5, 4 ㊵	B 6, 4 ㊶	G 7, 4 ㊷	B 8, 4 ㊸	G 9, 4 ㊹	B 10, 4 ㊺	G 11, 4 ㊻	B 12, 4 ㊼
R 1, 5 ㊽	G 2, 5 ㊾	R 3, 5 ㊿	G 4, 5 ㋀	R 5, 5 ㋁	G 6, 5 ㋂	R 7, 5 ㋃	G 8, 5 ㋄	R 9, 5 ㋅	G 10, 5 ㋆	R 11, 5 ㋇	G 12, 5 ㋈
G 1, 6 ㋉	B 2, 6 ㋊	G 3, 6 ㋋	B 4, 6 ㋌	G 5, 6 ㋍	B 6, 6 ㋎	G 7, 6 ㋏	B 8, 6 ㋐	G 9, 6 ㋑	B 10, 6 ㋒	G 11, 6 ㋓	B 12, 6 ㋔
R 1, 7 ㋕	G 2, 7 ㋖	R 3, 7 ㋗	G 4, 7 ㋘	R 5, 7 ㋙	G 6, 7 ㋚	R 7, 7 ㋛	G 8, 7 ㋜	R 9, 7 ㋝	G 10, 7 ㋞	R 11, 7 ㋟	G 12, 7 ㋠
G 1, 8 ㋡	B 2, 8 ㋢	G 3, 8 ㋣	B 4, 8 ㋤	G 5, 8 ㋥	B 6, 8 ㋦	G 7, 8 ㋧	B 8, 8 ㋨	G 9, 8 ㋩	B 10, 8 ㋪	G 11, 8 ㋫	B 12, 8 ㋬
R 1, 9 ㋭	G 2, 9 ㋮	R 3, 9 ㋯	G 4, 9 ㋰	R 5, 9 ㋱	G 6, 9 ㋲	R 7, 9 ㋳	G 8, 9 ㋴	R 9, 9 ㋵	G 10, 9 ㋶	R 11, 9 ㋷	G 12, 9 ㋸
G 1, 10 ㋹	B 2, 10 ㋺	G 3, 10 ㋻	B 4, 10 ㋼	G 5, 10 ㋽	B 6, 10 ㋾	G 7, 10 ㋿	B 8, 10 ㊀	G 9, 10 ㊁	B 10, 10 ㊂	G 11, 10 ㊃	B 12, 10 ㊄
R 1, 11 ㊅	G 2, 11 ㊆	R 3, 11 ㊇	G 4, 11 ㊈	R 5, 11 ㊉	G 6, 11 ㊊	R 7, 11 ㊋	G 8, 11 ㊌	R 9, 11 ㊍	G 10, 11 ㊎	R 11, 11 ㊏	G 12, 11 ㊐
G 1, 12 ㊑	B 2, 12 ㊒	G 3, 12 ㊓	B 4, 12 ㊔	G 5, 12 ㊕	B 6, 12 ㊖	G 7, 12 ㊗	B 8, 12 ㊘	G 9, 12 ㊙	B 10, 12 ㊚	G 11, 12 ㊛	B 12, 12 ㊜

$$\begin{aligned}
 R 1 &= (1 * R 11) / 1 \\
 R 2 &= (1 * R 11 + 3 * R 31) / 4 \\
 R 3 &= (1 * R 31 + 1 * R 51) / 2 \\
 R 4 &= (3 * R 51 + 1 * R 71) / 4 \\
 R 5 &= (1 * R 11 + 3 * R 13) / 4 \\
 R 6 &= (1 * R 11 + 3 * R 31 + 3 * R 13 + 9 * R 33) / 16 \\
 R 7 &= (1 * R 31 + 3 * R 33 + 1 * R 51 + 3 * R 53) / 8 \\
 R 8 &= (3 * R 51 + 9 * R 53 + 1 * R 71 + 3 * R 73) / 16 \\
 R 9 &= (1 * R 13 + 1 * R 15) / 2 \\
 R 10 &= (1 * R 13 + 3 * R 33 + 1 * R 15 + 3 * R 35) / 8 \\
 R 11 &= (1 * R 33 + 1 * R 53 + 1 * R 35 + 1 * R 55) / 4 \\
 R 12 &= (3 * R 53 + 3 * R 55 + 1 * R 73 + 1 * R 75) / 8 \\
 R 13 &= (3 * R 15 + 1 * R 17) / 4 \\
 R 14 &= (3 * R 15 + 9 * R 35 + 1 * R 17 + 3 * R 37) / 16 \\
 R 15 &= (3 * R 35 + 3 * R 55 + 1 * R 37 + 1 * R 57) / 8 \\
 R 16 &= (9 * R 55 + 3 * R 75 + 3 * R 57 + 1 * R 77) / 16
 \end{aligned}$$

FIG. 9B

$$\begin{aligned}G_1 &= (1 * G_{10} + 1 * G_{01} + 1 * G_{21} + 1 * G_{12}) / 4 \\G_2 &= (3 * G_{21} + 1 * G_{41}) / 4 \\G_3 &= (1 * G_{41}) / 1 \\G_4 &= (1 * G_{41} + 3 * G_{61}) / 4 \\G_5 &= (3 * G_{12} + 1 * G_{14}) / 4 \\G_6 &= (3 * G_{32} + 3 * G_{23} + 1 * G_{43} + 1 * G_{34}) / 8 \\G_7 &= (3 * G_{43} + 1 * G_{41}) / 4 \\G_8 &= (3 * G_{52} + 1 * G_{43} + 3 * G_{63} + 1 * G_{54}) / 8 \\G_9 &= (1 * G_{14}) / 1 \\G_{10} &= (1 * G_{14} + 3 * G_{34}) / 4 \\G_{11} &= (1 * G_{43} + 1 * G_{34} + 1 * G_{54} + 1 * G_{45}) / 4 \\G_{12} &= (3 * G_{54} + 1 * G_{74}) / 4 \\G_{13} &= (1 * G_{14} + 3 * G_{16}) / 4 \\G_{14} &= (1 * G_{34} + 3 * G_{25} + 1 * G_{45} + 3 * G_{36}) / 8 \\G_{15} &= (3 * G_{45} + 1 * G_{17}) / 4 \\G_{16} &= (3 * G_{65} + 3 * G_{56} + 1 * G_{67} + 1 * G_{76}) / 16\end{aligned}$$

$$\begin{aligned}B_1 &= (1 * B_{00} + 1 * B_{20} + 1 * B_{02} + 1 * B_{22}) / 4 \\B_2 &= (3 * B_{20} + 1 * B_{40} + 3 * B_{22} + 1 * B_{42}) / 8 \\B_3 &= (1 * B_{40} + 1 * B_{42}) / 2 \\B_4 &= (1 * B_{40} + 3 * B_{60} + 1 * B_{42} + 3 * B_{62}) / 8 \\B_5 &= (3 * B_{02} + 3 * B_{22} + 1 * B_{04} + 1 * B_{24}) / 8 \\B_6 &= (9 * B_{22} + 3 * B_{42} + 3 * B_{24} + 1 * B_{44}) / 16 \\B_7 &= (3 * B_{42} + 1 * B_{44}) / 4 \\B_8 &= (3 * B_{42} + 9 * B_{62} + 1 * B_{44} + 3 * B_{64}) / 16 \\B_9 &= (1 * B_{04} + 1 * B_{24}) / 2 \\B_{10} &= (3 * B_{24} + 1 * B_{44}) / 4 \\B_{11} &= (1 * B_{44}) / 1 \\B_{12} &= (1 * B_{44} + 3 * B_{64}) / 4 \\B_{13} &= (1 * B_{04} + 1 * B_{24} + 3 * B_{06} + 3 * B_{26}) / 8 \\B_{14} &= (3 * B_{24} + 1 * B_{44} + 9 * B_{26} + 3 * B_{46}) / 16 \\B_{15} &= (1 * B_{44} + 3 * B_{46}) / 4 \\B_{16} &= (1 * B_{44} + 3 * B_{64} + 3 * B_{46} + 9 * B_{66}) / 16\end{aligned}$$

FIG.10

R 1, 1	G 2, 1	R 3, 1	G 4, 1	R 5, 1	G 6, 1	R 7, 1	G 8, 1	R 9, 1	G 10, 1	R 11, 1	G 12, 1
⊕				⊕				⊕			
G 1, 2	B 2, 2	G 3, 2	B 4, 2	G 5, 2	B 6, 2	G 7, 2	B 8, 2	G 9, 2	B 10, 2	G 11, 2	B 12, 2
R 1, 3	G 2, 3	R 3, 3	G 4, 3	R 5, 3	G 6, 3	R 7, 3	G 8, 3	R 9, 3	G 10, 3	R 11, 3	G 12, 3
G 1, 4	B 2, 4	G 3, 4	B 4, 4	G 5, 4	B 6, 4	G 7, 4	B 8, 4	G 9, 4	B 10, 4	G 11, 4	B 12, 4
R 1, 5	G 2, 5	R 3, 5	G 4, 5	R 5, 5	G 6, 5	R 7, 5	G 8, 5	R 9, 5	G 10, 5	R 11, 5	G 12, 5
⊕				⊕				⊕			
G 1, 6	B 2, 6	G 3, 6	B 4, 6	G 5, 6	B 6, 6	G 7, 6	B 8, 6	G 9, 6	B 10, 6	G 11, 6	B 12, 6
R 1, 7	G 2, 7	R 3, 7	G 4, 7	R 5, 7	G 6, 7	R 7, 7	G 8, 7	R 9, 7	G 10, 7	R 11, 7	G 12, 7
G 1, 8	B 2, 8	G 3, 8	B 4, 8	G 5, 8	B 6, 8	G 7, 8	B 8, 8	G 9, 8	B 10, 8	G 11, 8	B 12, 8
R 1, 9	G 2, 9	R 3, 9	G 4, 9	R 5, 9	G 6, 9	R 7, 9	G 8, 9	R 9, 9	G 10, 9	R 11, 9	G 12, 9
⊕				⊕				⊕			
G 1, 10	B 2, 10	G 3, 10	B 4, 10	G 5, 10	B 6, 10	G 7, 10	B 8, 10	G 9, 10	B 10, 10	G 11, 10	B 12, 10
R 1, 11	G 2, 11	R 3, 11	G 4, 11	R 5, 11	G 6, 11	R 7, 11	G 8, 11	R 9, 11	G 10, 11	R 11, 11	G 12, 11
G 1, 12	B 2, 12	G 3, 12	B 4, 12	G 5, 12	B 6, 12	G 7, 12	B 8, 12	G 9, 12	B 10, 12	G 11, 12	B 12, 12

$$R = (9 * R_{11} + 3 * R_{31} + 3 * R_{13} + 1 * R_{33}) / 16$$

$$G = (3 * G_{21} + 3 * G_{12} + 1 * G_{32} + 1 * G_{23}) / 8$$

$$B = (1 * B_{00} + 3 * B_{02} + 3 * B_{20} + 9 * B_{22}) / 16$$

FIG.11

R1, 1	G2, 1	R3, 1	G4, 1	R5, 1	G6, 1	R7, 1	G8, 1	R9, 1	G10, 1	R11, 1	G12, 1
⊕		⊕		⊕		⊕		⊕		⊕	
G1, 2	B2, 2	G3, 2	B4, 2	G5, 2	B6, 2	G7, 2	B8, 2	G9, 2	B10, 2	G11, 2	B12, 2
R1, 3	G2, 3	R3, 3	G4, 3	R5, 3	G6, 3	R7, 3	G8, 3	R9, 3	G10, 3	R11, 3	G12, 3
⊕		⊕		⊕		⊕		⊕		⊕	
G1, 4	B2, 4	G3, 4	B4, 4	G5, 4	B6, 4	G7, 4	B8, 4	G9, 4	B10, 4	G11, 4	B12, 4
R1, 5	G2, 5	R3, 5	G4, 5	R5, 5	G6, 5	R7, 5	G8, 5	R9, 5	G10, 5	R11, 5	G12, 5
⊕		⊕		⊕		⊕		⊕		⊕	
G1, 6	B2, 6	G3, 6	B4, 6	G5, 6	B6, 6	G7, 6	B8, 6	G9, 6	B10, 6	G11, 6	B12, 6
R1, 7	G2, 7	R3, 7	G4, 7	R5, 7	G6, 7	R7, 7	G8, 7	R9, 7	G10, 7	R11, 7	G12, 7
⊕		⊕		⊕		⊕		⊕		⊕	
G1, 8	B2, 8	G3, 8	B4, 8	G5, 8	B6, 8	G7, 8	B8, 8	G9, 8	B10, 8	G11, 8	B12, 8
R1, 9	G2, 9	R3, 9	G4, 9	R5, 9	G6, 9	R7, 9	G8, 9	R9, 9	G10, 9	R11, 9	G12, 9
⊕		⊕		⊕		⊕		⊕		⊕	
G1, 10	B2, 10	G3, 10	B4, 10	G5, 10	B6, 10	G7, 10	B8, 10	G9, 10	B10, 10	G11, 10	B12, 10
R1, 11	G2, 11	R3, 11	G4, 11	R5, 11	G6, 11	R7, 11	G8, 11	R9, 11	G10, 11	R11, 11	G12, 11
⊕		⊕		⊕		⊕		⊕		⊕	
G1, 12	B2, 12	G3, 12	B4, 12	G5, 12	B6, 12	G7, 12	B8, 12	G9, 12	B10, 12	G11, 12	B12, 12

$$R = (9 * R11 + 3 * R31 + 3 * R13 + 1 * R33) / 16$$

$$G = (3 * G21 + 3 * G12 + 1 * G32 + 1 * G23) / 8$$

$$B = (1 * B00 + 3 * B02 + 3 * B20 + 9 * B22) / 16$$

FIG.12

R1,1	G2,1	R3,1	G4,1	R5,1	G6,1
G1,2	B2,2	G3,2	B4,2	G5,2	B6,2
R1,3	G2,3	R3,3 ①	G4,3 ②	R5,3	G6,3
G1,4	B2,4	G3,4 ③	B4,4 ④	G5,4	B6,4
R1,5	G2,5	R3,5	G4,5	R5,5	G6,5
G1,6	B2,6	G3,6	B4,6	G5,6	B6,6

$$R1 = R3,3$$

$$G1 = (G3,2 + G2,3 + G4,3 + G3,4)/4$$

$$B1 = (B2,2 + B4,2 + B2,4 + B4,4)/4$$

$$R2 = (R3,3 + R5,3)/2$$

$$G2 = (G3,2 + G5,2 + 4G4,3 + G3,4 + G5,4)/8$$

$$B2 = (B4,2 + B4,4)/2$$

$$R3 = (R3,3 + R3,5)/2$$

$$G3 = (G2,3 + G4,3 + 4G3,4 + G2,5 + G4,5)/8$$

$$B3 = (B2,4 + B4,4)/2$$

$$R4 = (R3,3 + R5,3 + R3,5 + R5,5)/4$$

$$G4 = (G4,3 + G3,4 + G5,4 + G4,5)/4$$

$$B4 = B4,4$$